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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/697,944	10/31/2003	Naoya Sashida	021557A	8925
23850 7590 05/23/2008 KRATZ, QUINTOS & HANSON, LLP 1420 K Street, N.W. Suite 400 WASHINGTON, DC 20005				
EXAMINER				
DICKEY, THOMAS L				
ART UNIT		PAPER NUMBER		
2826				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/697,944

Applicant(s)

SASHIDA, NAOYA

Examiner

Thomas L. Dickey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 May 2008.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 21-24 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-5 and 21-24 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 31 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 10/315,929.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____

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DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/04/2008 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 21-23 are rejected under 35 U.S.C. 102(b) as being anticipated by CUCHIARO ET AL. (6,225,656).

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With regard to claim 21 Cuchiaro et al. discloses a semiconductor device comprising a first insulating film 116 formed over a semiconductor substrate 102; a capacitor 120 constructed by forming a lower electrode 122, a dielectric film 124, and an upper electrode 126 sequentially over the first insulating film 116; a first capacitor protection insulating film 137 covering the upper surface of the upper electrode 126 and the aspect of the upper electrode 126 and the dielectric film 124; a second capacitor protection insulating film 138 formed over the first capacitor protection insulating film 137; and a second insulating film 139 formed in its entirety on the second capacitor protection insulating film 138. Note figure 3 and column 7 lines 20-65 of Cuchiaro et al.

With regard to claims 22 and 23 Cuchiaro et al. discloses a semiconductor device comprising a first insulating film 116 formed over a semiconductor substrate 102; a capacitor 120 constructed by forming a lower electrode 122, a dielectric film 124, and an upper electrode 126 sequentially over the first insulating film 116; a first capacitor protection insulating film 138 covering the dielectric film 124 and the upper electrode 126; a second capacitor protection insulating film 139 formed over the first capacitor protection insulating film 138; a second insulating film 136 formed over the second capacitor protection insulating film 139; and a first-layer metal wiring 160 formed over the second insulating film 136 and connected electrically to the upper electrode 126 via a contact hole 148 extending through the second insulating film 136, the second

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capacitor protection insulating film 139 and the first capacitor protection insulating film 138. Note figure 3 and column 7 lines 20-65 of Cuchiaro et al.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over CUCHIARO ET AL. (6,225,656) in view of FURUMURA ET AL. (5,506,443).

With regard to claims 1-5 Cuchiaro et al. discloses a semiconductor device comprising a first insulating film 116 formed over a semiconductor substrate 102; a capacitor 120 constructed by forming a lower electrode 122, a PZT (note column 9 line 15) dielectric film 124, and an upper electrode 126 sequentially over the first insulating film 116; a silicon nitride (note column 3 line 40) first capacitor protection insulating film 138 covering the dielectric film 124 and the upper electrode 126; a second capacitor protection insulating film 139 formed over the first capacitor protection insulating film 138; a silicon oxide (note column 6 line 3) second insulating film 136 formed over the second capacitor protection insulating film 139; and a first-layer metal wiring 160 formed

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over the second insulating film 136 and connected electrically to the upper electrode 126 via a contact hole 148 extending through the second insulating film 136, the second capacitor protection insulating film 139 and the first capacitor protection insulating film 138. Note figure 3 and column 7 lines 20-65 of Cuchiaro et al.

Cuchiaro et al. does not disclose that an amount of carbon contained in the second capacitor protection insulating film is larger than an amount of carbon contained in the second insulating film.

However, Furumura et al. discloses a semiconductor device wherein an SiO₂ layer (such as Cuchiaro et al.'s SiO₂ second insulating layer 136) is strongly affixed to an underlying SiN layer (such as Cuchiaro et al.'s SiN films 138-139) by virtue of the upper portion (such as Cuchiaro et al.'s SiN second capacitor protection insulating film 139) of the SiN layer being infused with a carbon concentration 100-1000 times higher than the carbon concentration of the overlying SiO₂ layer (equivalent to Cuchiaro et al.'s second insulating layer 136). Note claims 1-4, as well as figure 2, of Furumura et al. Furumura et al. explain, note column 4 lines 55-67 and the table topping column 5, that it has been experimentally verified that a high carbon-content SiN layer at an SiN/SiO₂ interface prevents "peel-off" of the overlying SiO₂ layer. it would therefore have been obvious to a person having skill in the art to raise the carbon levels of the SiN second capacitor protection insulating film 139 at the SiN/SiO₂ interface of Cuchiaro et al.'s

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semiconductor device, such as is taught by Furumura et al., in order to increase adherence between this layer and the overlying SiO₂ second insulating film 136 to thus prevent "peel-off" and subsequent failure of the device.

With regard to claim 24 Cuchiaro et al. discloses a semiconductor device comprising a first insulating film 116 formed over a semiconductor substrate 102; a capacitor 120 constructed by forming a lower electrode 122, a dielectric film 124, and an upper electrode 126 sequentially over the first insulating film 116; a first capacitor protection insulating film 138 covering the dielectric film 124 and the upper electrode 126; a second capacitor protection insulating film 139 formed over the first capacitor protection insulating film 138, the second capacitor protection insulating film 139 covering continuously over the capacitor 120 and the first insulating film 116; and a second insulating film 136 formed over the second capacitor protection insulating film 139.

Cuchiaro et al. does not disclose that an amount of carbon contained in the second capacitor protection insulating film is larger than an amount of carbon contained in the second insulating film.

However, Furumura et al. discloses a semiconductor device wherein an SiO₂ layer (such as Cuchiaro et al.'s SiO₂ second insulating layer 136) is strongly affixed to an underlying SiN layer (such as Cuchiaro et al.'s SiN films 138-139) by virtue of the upper portion (such as Cuchiaro et al.'s SiN second capacitor protection insulating film 139) of

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the SiN layer being infused with a carbon concentration 100-1000 times higher than the carbon concentration of the overlying SiO₂ layer (equivalent to Cuchiario et al.'s second insulating layer 136). Note claims 1-4, as well as figure 2, of Furumura et al. Furumura et al. explain, note column 4 lines 55-67 and the table topping column 5, that it has been experimentally verified that a high carbon-content SiN layer at an SiN/SiO₂ interface prevents "peel-off" of the overlying SiO₂ layer. it would therefore have been obvious to a person having skill in the art to raise the carbon levels of the SiN second capacitor protection insulating film 139 at the SiN/SiO₂ interface of Cuchiario et al.'s semiconductor device, such as is taught by Furumura et al., in order to increase adherence between this layer and the overlying SiO₂ second insulating film 136 to thus prevent "peel-off" and subsequent failure of the device.

Response to Arguments

5. Applicant's arguments filed 05/04/2008 have been fully considered but they are not persuasive.

It is argued, at page 7 of the remarks, that "Cuchiario discloses elements 137 and 138 as lower and center region of hydrogen barrier layer 135 (see, col. 7, lines 36 - 50 in Cuchiario). Thus, the elements 137 and 138 are not separate layers. Rather, they are some portions of the layer 135. To the contrary, the applicant's claimed first and second

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capacitor protection insulating films set forth in claims 21 and 22 are required to be films." However, it is quite common in the semiconductor art for a disclosure to bundle two or more films together to make a thicker film. These disclosures typically make it clear that when the thinner films join together to make a thick film they are not deprived of their individual character. For example, paragraph 0022 of US 2004/0089894 A1 states that a "capacitor protection insulating film [is] formed to have a double-layered structure consisting of the lower protection insulating film, which covers the dielectric film and the upper electrode of the capacitor, and the upper protection insulating film, which is formed on the lower protection insulating film and the first insulating film." These writers of US 2004/0089894 A1¹ (who appear typical of writers of technical disclosures filed at this Office) make it clear that the "lower protection insulating film" and the "upper protection insulating film" have individual characters, even though they each form "some portions" of the double-layered "capacitor protection insulating film."

Thus it is with Cuchiaro's elements 137 and 138. Cuchiaro has explained, at paragraph 13 lines 40-45, that "regions"² 137 and 139 each form a layer having 10-20% of the thickness of the total layer 135, leaving 60-80% of "compound" layer 135 for layer

¹ Applicants will no doubt recognize US 20040089894 A1 as the published version of the current application.

² as Cuchiaro calls them. From figure 3 one can tell that "regions" 137, 138, and 139 are wide and thin and spread horizontally across Cuchiaro's substrate. Shall we say, for the sake of argument, that

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("region") 138. Note column 7 lines 40-45. Further, layers 137 and 139 have a distinct composition from the composition of layer ("region") 138 in that layers ("regions") 137 and 138 are approximately 2 weight per cent oxygen (not column 7 lines 54-55) while "the concentration by weight of oxygen in the center region 138 of layer 135 is zero" (column 7 lines 50-51).

Further, "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The reference must disclose the claimed elements, arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990). According to the rule set forth in *Bond*, applicants' argument that Cuchiario uses the term "region", instead of Applicants' preferred term ("film") is moot.

It is asserted, at page 9 of the remarks, that "There is nothing in the teachings of Cuchiario that use SiN layer as the hydrogen barrier layer. As submitted above, titanium nitride is deposited as the hydrogen barrier layer in Cuchiario. Such teaching does not

Applicants' device is different from Cuchiario's device in the same way a "film" is different from a thin, wide, horizontally spread out "region"?

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motivate one skilled in the art to combine the Cuchiaro's device and Furumura's device that is directed to SiN layer."

It is incorrect to assert that Cuchiaro fails to disclose a SiN hydrogen barrier layer. At column 3 lines 37-39, Cuchiaro states, "Preferably, the hydrogen barrier layer comprises a nitride of titanium or silicon." (emphasis added) Note also that in claim 8 Cuchiaro claims, "A ferroelectric integrated circuit as in claim 4, wherein said hydrogen barrier layer comprises a nitride of titanium," whereas in claim 9 Cuchiaro claims, "A ferroelectric integrated circuit as in claim 4, wherein said hydrogen barrier layer comprises a nitride of silicon." In fact, Cuchiaro makes it very clear that SiN and TiN are interchangeable in the formation of the hydrogen barrier layer he discloses.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L. Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, please contact the examiner's supervisor, Sue A. Purvis, at 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent

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Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**/Thomas L Dickey/
Primary Examiner, Art Unit 2826**